

A new species and a new record of Muricidae (Gastropoda) from Brazil: genera *Pterynotus* and *Leptotrophon*

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ABSTRACT

Leptotrophon atlanticus, a new species of *Leptotrophon* Houart, 1995, a genus of Trophoninae previously known only from the Indo-Pacific Ocean, is described from the northeastern coast of Brazil, from depths of 240–260 m. *Leptotrophon atlanticus* is very similar to *Leptotrophon kastoroac* Houart, 2001, but has shorter spines, which are brown colored. The shell microsculpture of *L. atlanticus* was studied using scanning electron microscopy, which revealed a protoconch slightly granulated on the last quarter of the whorl and a teleoconch with growth striae crossed by regularly spaced zigzag spiral lines and axial microstriae. The radula of *L. atlanticus* fits the pattern described for the genus, but the lateral/marginal cusps of the rachidian teeth are not as independent of each other, being somewhat fused into a common base. This study reports the first record from the South Atlantic Ocean of the Muricinae *Pterynotus havanensis* Vokes, 1970, previously known only from the Caribbean region.

Additional keywords: Muricinae, Trophoninae, South Atlantic, biodiversity, taxonomy

INTRODUCTION

The family Muricidae is represented in Brazil by 49 species from six subfamilies, of which members of the subfamily Muricinae are most numerous, with 24 species in nine genera (Rios, 1994). Other genera of Muricinae recorded from the western Atlantic have never been recorded from Brazil until now. This includes the genus *Pterynotus*, which is found in deeper-water habitats (Vokes, 1970), with eight species reported from Florida and the Caribbean (Rosenberg, 2005), in addition to mention records from other regions of the world, e.g. Ponder (1972) from Australia, Bouchet and Warén (1985) from the northeast Atlantic, and Houart (2001) from New Caledonia.

The subfamily Trophoninae includes 18 genera (Vanght, 1989). It is represented in the western Atlantic

by five genera, of which only *Trophon* Montfort, 1810, occurs in Brazil (Rios, 1994). More recently, Houart (1995) described the genus *Leptotrophon*, whose 26 species are restricted to the Indo-Pacific region, in New Caledonia (Houart, 1995, 2001) and eastern Indonesia (Houart, 1997).

This report presents the first record of the genus *Pterynotus* Swainson, 1833 from Brazil, based on *Pterynotus havanensis* Vokes, 1970, as well as the first record of the genus *Leptotrophon* from the Atlantic Ocean, based on a new species described from northeast Brazil.

MATERIALS AND METHODS

This report is based on a sample collected on the Canopus Bank, State of Ceará, in 2005, from a biogenic substratum, in 240–260 m depth. Identification of the species was based on original and subsequent descriptions. In cases where fragments of soft parts were available, an attempt was made to record some anatomical characteristics using camera lucida, especially of the head-foot and the pallial cavity. Radulae were prepared for SEM according to the methodology described by Bandel (1984).

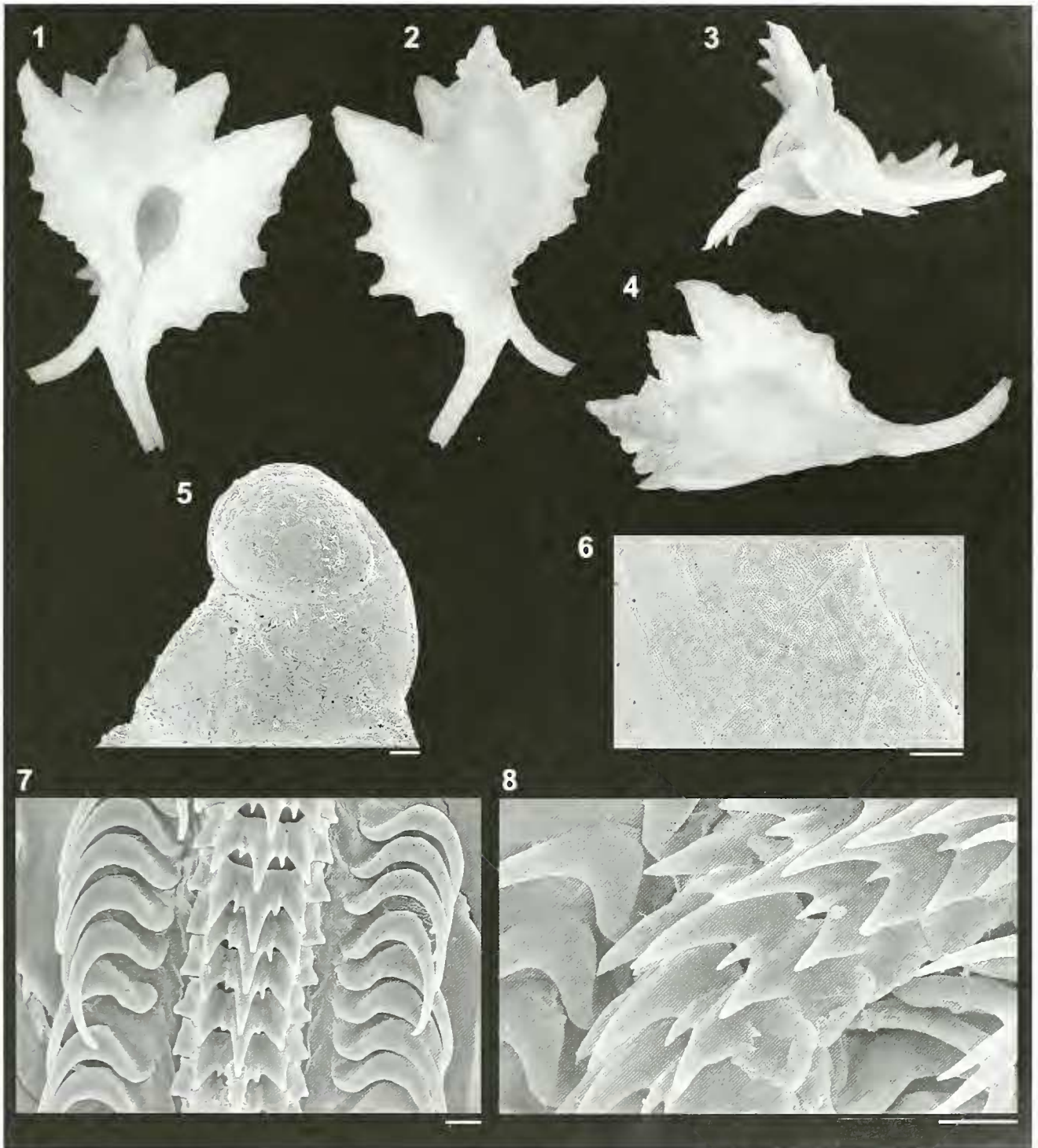
SYSTEMATICS

Family Muricidae Rafinesque, 1815
Subfamily Muricinae Rafinesque, 1815
Genus *Pterynotus* Swainson, 1833

Type Species: *Murex pinuatus* Swainson, 1822 by subsequent designation.

Pterynotus havanensis Vokes, 1970
(Figures 1–12)

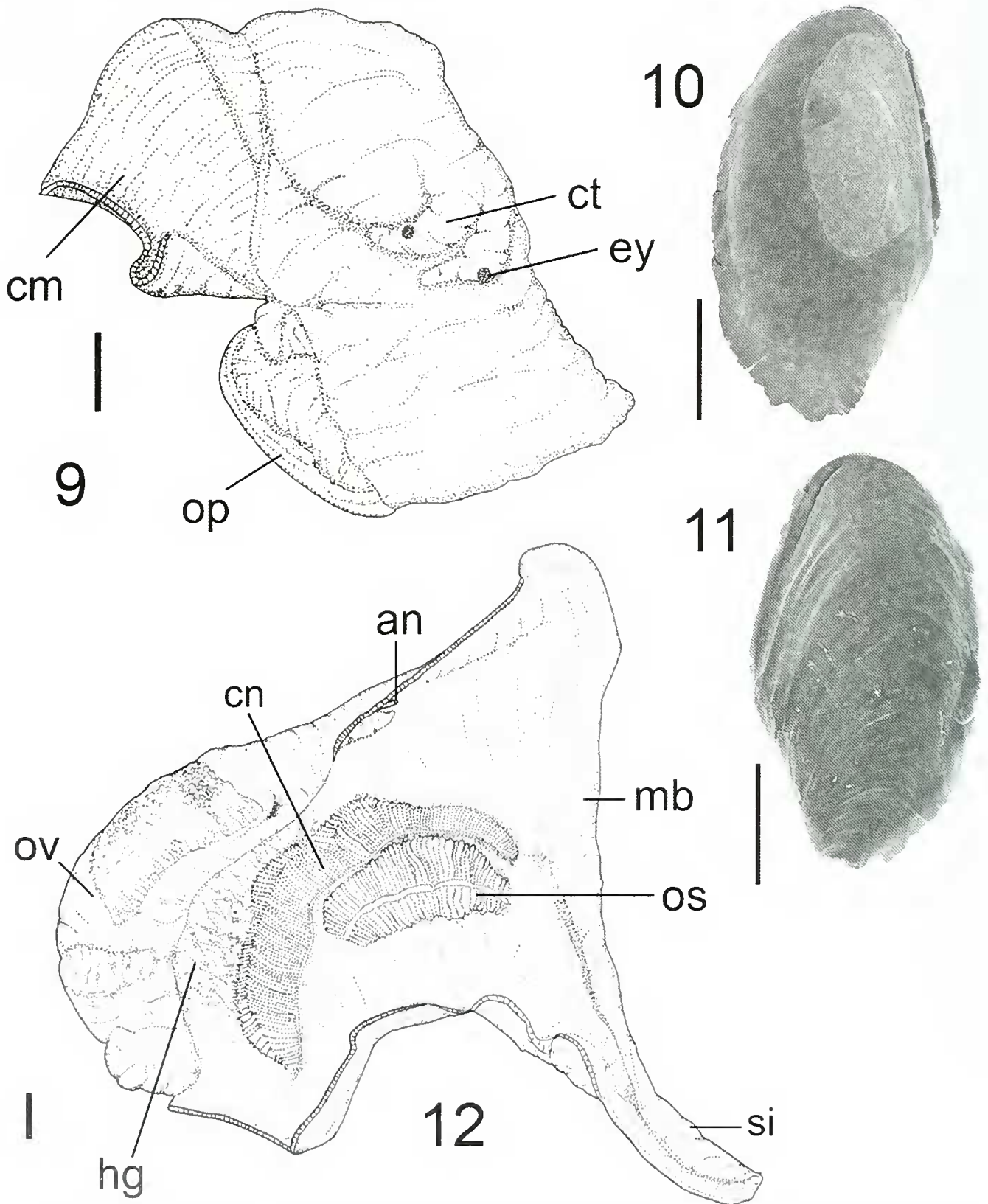
Pterynotus (Pterynotus) havanensis Vokes, 1970 (new name for *Murex tristichus* Dall, 1889, non *Murex tristichus* Beyrich, 1854.)



Figures 1–8. *Pterynotus havanensis* Vokes, 1970: 1–4, 7–8. MNRJ 11057, length = 24.4 mm, width = 16.5 mm. 5–6. MNRJ 11003. 1. Shell in apertural view. 2. Shell in abapertural view. 3. Shell in apical view. 4. Shell in lateral view. 5. Protoconch. 6. Detail of teleoconch sculpture. 7. Radulae in dorsal view. 8. Detail of rachidian teeth. Scale bars: 5–6 = 100 µm; 7–8 = 10.0 µm.

Murex *Pteronotus* *tristichus* Dall, 1889: 202, pl. 15, fig. 2).
Pteropurpura tristicha.—Dall, 1927: 55.
Murex (*Pterynotus*) *tristichus*.—Clench and Farfante, 1945: 36, pl. 20, figs. 1–4.

Pterynotus phaneus auct.—Abbott, 1974: 175, fig. 1556 (non Dall, 1889).
Pterynotus phaneus Dall.—Radwin and D’Attilio, 1976: 100 (in part).



Figures 9–12. *Pterynotus havancensis* Vokes, 1970 (MNRJ 11057). 9. Head-foot in apertural view, female. 10. Operculum in inner view. 11. Operculum in outer view. 12. Palial cavity, female. Scale bars = 1.0 mm. Abbreviations: an, anus; cm, columnellar muscle; cn, ctenidium; ct, cephalic tentacle; ey, eye; hg, hypobranchial gland; mb, mantle border; op, operculum; os, osphradium; ov, oviduct; si, siphon.

Pterynotus havanensis Vokes.—Fair, 1976: 47, pl. 13, fig. 164.

Pterynotus (Pterynotus) phaneus auct.—Harasewych and Jensen, 1979: 4, fig. 3 (in part, non Dall, 1889).

Description: Shell of moderate size (up to 25 mm in length), fusiform, thin; color white. Protoconch paucispiral, with 1.5 whorls, glassy, slightly bulbous, ending in a thin varix. Teleoconch with up to five whorls, somewhat convex in outline, with three thin, flaring, backward-curved, wing-like varices per whorl, with 5–6 digitations along margin of last whorl varices. Axial sculpture consisting of fine growth striae, more visible in ventral view of varices, where they cross with spiral threads, giving it a foliaceous appearance; no intervarical nodes present. Spiral sculpture obsolete, barely discernible spiral threads, formed by microscopic shallow furrows, somewhat undulated and irregularly spaced; abapertural view of varices with five–six spiny digitations per varix on the last whorl and two digitations on spire varices; spine on shoulders of whorls largest. Aperture oval, peristome slightly projected, inner lip reflected, attached posteriorly, smooth, with small undulations corresponding to varical digitations; outer lip smooth. Siphon canal rather long, sharply bent abaperturally and to the right side; narrowly open; with previous, old imbricate canal termination, recurved to the left side.

RADULA (FEMALE): Rachiglossate type; radula ribbon long and narrow; rachidian teeth with five pointed cusps, central cusp the largest, the second largest at the margins, each area between central and marginal cusps with an acute tiny cusp; marginal edge rectangular and somewhat pointed, base concave; lateral teeth sickle-shaped, broader at the base.

HEAD-FOOT (FEMALE): Head poorly differentiated, eyes located laterally and in middle of somewhat long cephalic tentacles. Foot large. OPERCULUM horny, ovate, covering entire shell aperture; external surface with terminal nucleus and concentric growth lines; inner surface attachment area with single horseshoe-shaped scar, not positioned centrally, covering less than 50% of total area of operculum, with one adventitious layer.

PALLIAL CAVITY (FEMALE): Mantle border smooth; siphon long and narrow, with smooth border, muscle attachment reaching as far as gill. Osphradium bipectinate, unequal, right side about 1.5 times as wide as left, broad and long (about half total ctenidium length). Ctenidium monopectinate, long and narrow. Hypobranchial gland a thin, poorly developed glandular mass covering mantle between anterior end of gill and oviduct. Oviduct occupying about half of pallial cavity length, broad.

Type Locality: Blake Station 51, off Havana, Cuba, between 445 m and 823.5 m.

Material Examined: MNRJ 11003 (one individual and seven empty shells); MNRJ 11067 (one individual);

MNRJ 11057 (one individual); all from Canopus Bank, 96 miles off Ceará State, 240–260 m depth, from biogenic substratum.

Geographic Distribution: Off Georgia and Fernandina (Dall, 1927), Key West (Fair, 1976) Florida, USA; Havana, Cuba (type locality); Pleistocene Moín Formation, Costa Rica (Vokes, 1992); Golfo of Urabá, Colombia (Vokes, 1992); Ceará State, Brazil (this study).

Discussion: *Pterynotus havanensis* Vokes, 1970, was originally described as *Murex (Pteronotus) tristichus* Dall, 1889. The taxon was later included in a long list of synonyms of *Pterynotus phaneus* (Dall, 1889) by Harasewych and Jensen (1979), based on a wide variation found in several shell characteristics such as the axial sculpture, intervarical nodes and outer lip. Vokes (1992) revalidated *P. havanensis*, based on the more numerous varices on the early teleoconch whorls and the smoother shell surface.

The only available published illustrations of *P. havanensis* are those of the holotype (Dall, 1889: pl. 15, fig. 2; Clench and Farfante, 1945: pl. 20, figs. 1–4; Vokes, 1970: pl. 3, figs. 1a,b; Abbott, 1974: fig. 1856; Fair, 1976: pl. 13, fig. 164; Harasewych and Jensen, 1979: fig. 3; Vokes, 1992: pl. 2, fig. 3), in addition to a Pleistocene fossil specimen from Costa Rica (Vokes, 1992: pl. 2, fig. 6). This study provides the first illustrations of Recent specimens (Figures 1–4), except for that of the holotype itself.

The Brazilian specimens herein studied, all from Canopus Bank, about 96 miles off the coast of the State of Ceará (240–260 m depth), are very similar to the holotype illustrations, with little sculpturing between the varices (Figures 1–2, 4), without the intervarical nodes described for *P. phaneus*, in addition to axial and spiral growth lines, the digitations on the margins of the varices and no denticulate outer lip (Figure 1). These characteristics, along with the shape and sculpture of the varices, clearly distinguishes *P. havanensis* from *P. phaneus*.

Vokes (1992) stated that both *P. phaneus* and *P. havanensis* have denticulations on the inner side of the outer lip. However, this detail is not stated in the original or subsequent descriptions of this species, as well as in the holotype illustrations, which show a smooth outer lip, as well as in the specimens from Brazil. Such denticles reported by Vokes (1992) probably correspond to the undulations by the varical digitations. In addition, Vokes (1992) considered that *P. havanensis* bears several varices on the early teleoconch whorls, making reference to the figure in Harasewych and Jensen (1979). Brazilian specimens bear the usual three varices on the first teleoconch whorls.

The radula herein illustrated (Figures 7–8) has some minor differences from the radula of *P. phaneus* illustrated in Harasewych and Jensen (1979: 15, fig. 17). In *P. havanensis*, the central and lateral cusps are longer in relation to the total length of the tooth; also, the two inner cusps are narrower and shorter.

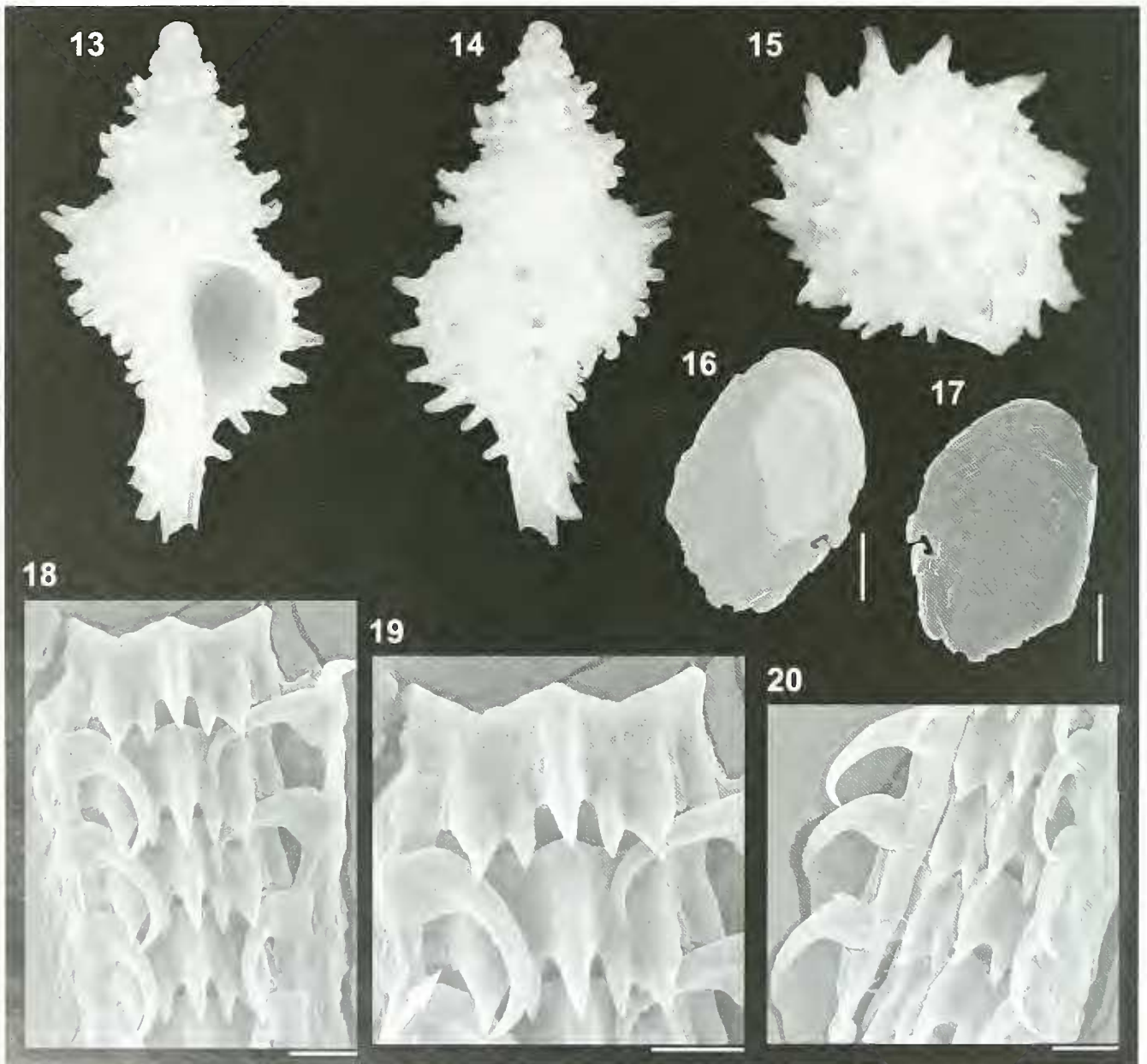
Subfamily Trophoninae Cossmann, 1903
Genus *Leptotrophon* Houart, 1995

Type Species: *Leptotrophon carcae* Houart, 1995, by original designation. Recent, New Caledonia.

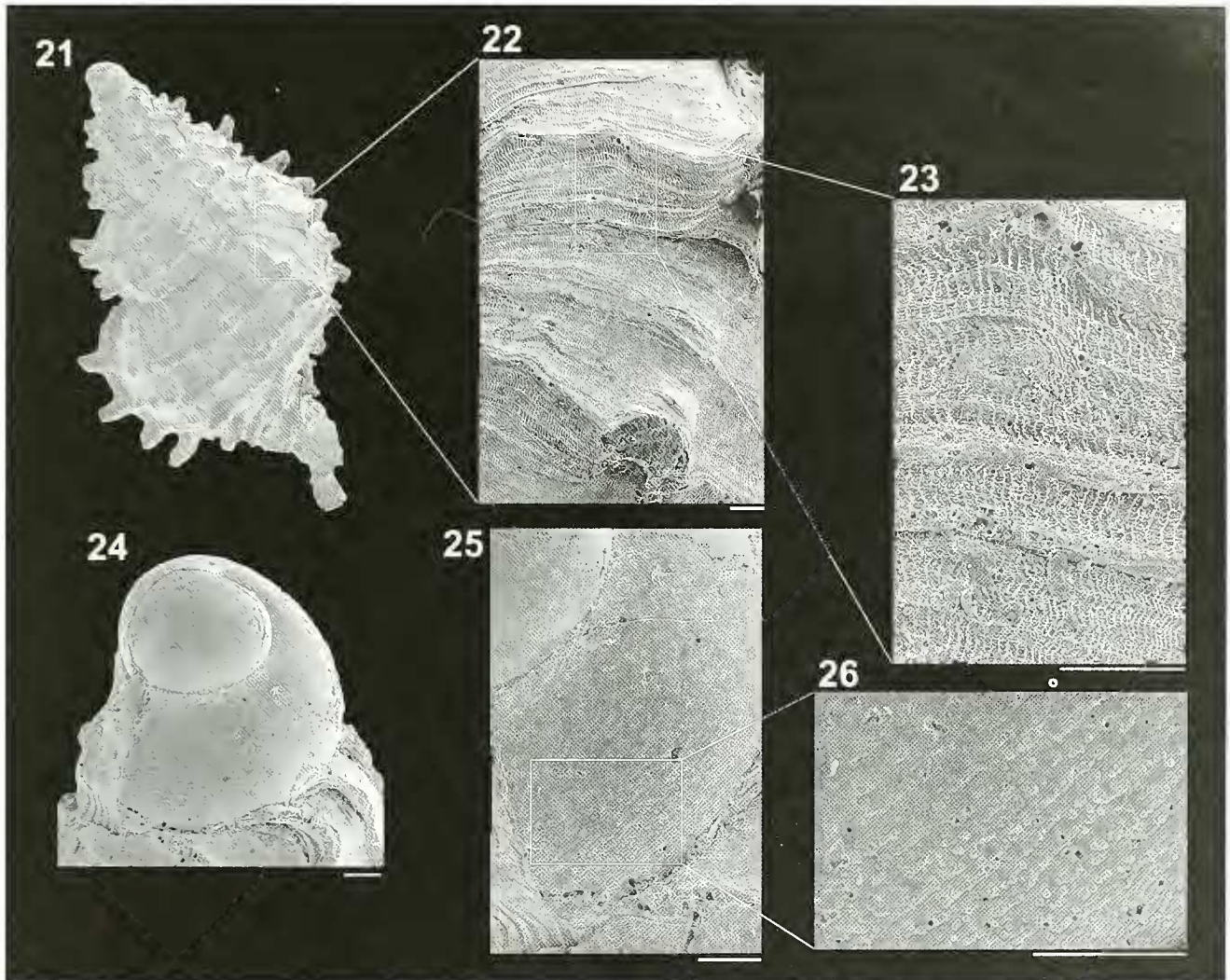
Leptotrophon atlanticus new species
(Figures 13–26)

Diagnosis: Shell densely spiny; color cream white with brown spines; paucispiral protoconch with slight granulated microsculpture on last quarter of last whorl.

Description: Shell up to 8.8 mm in length (holotype), biconic, and densely spiny; spire high. Color creamy white, with light brown spines in live specimens. Protoconch rounded, paucispiral, with 1.50 to 1.75 whorls, with slightly granulated microsculpture, forming faded spiral cords on last quarter of last whorl; terminal varix low. Teleoconch with up to 4.25 slightly shouldered whorls. Suture impressed. Axial sculpture consisting of numerous weak, orthocline lamellate growth striae and spiny varices, regularly spaced, forming spines at interceptions of spiral cords. Spiral sculpture on spire of two



Figures 13–20. *Leptotrophon atlanticus* new species. Holotype. MNRJ 11004, length = 8.8 mm, width = 4.6 mm). 13. Apertural view. 14. Abapertural view. 15. Apical view. 16. Operculum in inner view. 17. Operculum in outer view. 18. Radulae in dorsal view. 19. Detail of rachidian teeth. 20. Detail of lateral teeth. Scale bars: 16–17 = 500 μ m; 18–20 = 10 μ m.



Figures 21–26. *Leptotrophon atlanticus* new species. Paratype, MNRJ 11009, length = 8.2 mm, width = 4.4 mm. **21.** Abapertural view. **22.** Detail of sculpture on teleoconch whorl. **23.** Detail of microsculpture on teleoconch whorl. **24.** Protoconch. **25–26.** Detail of protoconch sculpture. Scale bars = 100 μ m.

strong cords, the adapical one located at $1/3$ of whorl height below the suture; interceptions between axial varices and spiral cords form two primary spines regularly arranged in spiral crowns, each crown with 9–10 spines on last whorl of holotype; spines tall, channeled, commonly adapically and backward-curved, slightly larger at shoulder; spaces between adjacent spines have a squamous appearance, due to crossing of spiral cords with axial growth striae; last whorl with four additional spiral spiny crowns, regularly arranged at the base, along with corresponding spiral cords; secondary squamous small spines appear irregularly arranged, interspaced with primary spines; holotype with a secondary spiral cord appearing between the two primary ones closest to the suture, on the last half of the last whorl. Microsculpture formed by growth striae crossed by regularly spaced zigzag spiral lines and axial microstriae. Aperture slightly oval, rounded adapically with about $1/3$ of total shell height. Columnellar

lip flaring, smooth and adapically adherent. Anal notch indistinct. Outer lip smooth, fragile, primary spiral cords and growth striae visible within. Siphon canal long, narrow, bent backwards, narrowly open and smooth, with seven imbricate old canal terminations.

RADULA (FEMALE): of rachiglossate type; radula ribbon long and narrow; rachidian tooth trapezoidal, with five pointed cusps; the two lateral cusps adjacent to central cusp somewhat fused into a bifurcated cusp, outermost cusps slightly larger; marginal edges rectangular well pointed, area between outer cusps and marginal edges with two very small folds; base somewhat sinuous; lateral teeth sickle-shaped, broader at base.

OPERCULUM horny, elliptical, covering entire shell aperture; external surface with terminal nucleus and concentric growth lines; inner surface attachment area with single horseshoe-shaped scar, not positioned centrally;

covering about 50% of total area of operculum, with one adventitious layer.

Type Material: Holotype: MNRJ 11004 (8.8 mm); three paratypes: MNRJ 11009, all from type locality.

Type Locality: Canopus Bank, 96 miles off Ceará State, 240–260 m depth, from biogenic substratum.

Distribution: Known from type locality only.

Discussion: The allocation of *Leptotrophon* in Trophoninae follows Houart (1995), who, when describing *Leptotrophon*, stated that he was considering Trophoninae in a traditional way, to include typical “Trophon-like” species, diagnosed as small, thin spinose shells with a flaring columellar lip. In fact, Kool (1993) stated that Trophoninae is probably a non-monophyletic group and, thus, Houart (1995) considered that future studies would probably show that the genus *Leptotrophon* would have to be transferred from the Trophoninae.

The new species fits very well in the diagnosis of *Leptotrophon*, and is very similar to several species from the Indo-Pacific, including the type species, *L. caroac*.

Leptotrophon atlanticus bears the characteristic spiny sculpture (Figures 13–15), round-ovate aperture, and flaring columellar lip (Figure 13). The radula of *L. atlanticus* (Figures 18–20) fits the pattern described for *Leptotrophon*, but the lateral/marginal cusps are not as independent of each other, being somewhat fused into a common base (Figure 19). In other species referred to *Leptotrophon* by Houart (1995), the lateral/marginal cusps are similar to *L. atlanticus* [e.g., *L. caroac* and *L. acerapex* (Houart, 1986)]. In addition, two small marginal denticles may be seen on the outer base of the marginal cusps (white arrow in Figure 19), a characteristic found in other species of *Leptotrophon* described by Houart (1995).

The protoconch of the species described by Houart (1995) shows considerable variation in shape, with rounded-globose, acuminate, or carinate protoconchs present in different species. The type species has a carinate protoconch, and *Leptotrophon atlanticus* has a rounded-globose protoconch (Figure 24).

The most similar species are *L. kastoroae* Houart, 1997, and *L. perclarus* Houart, 2001. Both species are larger than *L. atlanticus*. *Leptotrophon perclarus* has a taller spire, more acuminate apex, and more inflated last whorl; in addition, it has more numerous and smaller spines. The shell shape of *L. kastoroae* is almost identical to that of *L. atlanticus*, but the spines are longer and are more upward-curved.

Previously to this work, no record of shell microsculpture for any species of *Leptotrophon* was available. The protoconch is always described as smooth. In fact, the protoconch of *L. atlanticus* has an overall smooth appearance (Figure 24), but SEM reveals that only its most apical region is smooth; the last quarter area, close to the varix, bears spiral sets of microscopic granulations (Figures 25–26). A delicate microsculpture also covers the

entire teleoconch surface, including the spiral cords and spines, with axial and spiral microstriae forming a somewhat reticulate pattern (Figures 22–23).

The operculum of *L. atlanticus* is similar in its outer surface to those illustrated by Houart (1995) for species of *Leptotrophon* from the New Caledonian region. Houart (1995) did not describe the operculum of *Leptotrophon* internally; the operculum of *L. atlanticus* has one adventitious layer.

In spite of the several common characteristics in the shell and radulae morphology of *Leptotrophon atlanticus* and the species from the Indo-Pacific, the generic allocation herein used should be considered as provisional, due to the wide geographic separation between the new species and the other species in the genus *Leptotrophon*, most of which bearing protoconchs that indicate non-planktotrophic development. All 26 previously described species of *Leptotrophon* are restricted to the Indo-Pacific (Houart, 1995; 1997; 2001); *Leptotrophon atlanticus* new species is the first record of this genus outside that region. The bathymetry of *L. atlanticus*, on the other hand, falls within the bathymetric range reported for the Indo-Pacific species (200–720 m). In the future, direct comparisons with the Indo-Pacific species, especially including characters visible only under SEM, would be most helpful to establish the degree of similarity among these species.

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